```
function y = embed_wm(x);
% y = embed_wm(x)
%

%File Name: embed_wm.m
%Last Modification Date: Wed Nov 1 2000
%File Creation Date: Wed Nov 1 2000
%Author: Jun Tian <jtian@digimarc.com>
%
%Copyright: All software, documentation, and related files in this dis
tribution
%            are Copyright (c) 2000 Digimarc Corporation
%
%Change History:
%
%Bug Report: mail to jtian@digimarc.com
%

x = haar(x);

[m,n] = size(x);

bits = 0;

for i = 1:m
    for j = (n/2+1):n
        if (x(i,j) >= 0)
            bits = [bits +];
        else
            bits = [bits -];
        end

        a = abs(x(i,j)) + 1;
        a = a - 2^(floor(log(a)/log(2)));

        while (a > 0)
            bits = [bits (a - 2*floor(a/2))];
            a = a - 2 * floor(a/2);
        end
    end
end

for i = (m/2+1):m
    for j = 1:(n/2)
        if (x(i,j) >= 0)
            bits = [bits +];
        else
            bits = [bits -];
```

```
        end

        a = abs(x(i,j)) + 1;
        a = a - 2^(floor(log(a)/log(2)));

        while (a > 0)
            bits = [bits (a - 2*floor(a/2))];
            a = a - 2 * floor(a/2);
        end
    end
end

bits = [bits SHA-1(x(1:(m/2),1:(n/2)))];
bits = bits(2:length(bits));
b = arithmetic_coding(bits);
k = 1;

for i = 1:m
    for j = (n/2+1):n
        q = max_capacity(x(i,j));
        a = 1
        for l = 1:q
            a = a*2 + b(k);
            k = k + 1;
        end
        if (sign(x(i,j)) >= 0)
            x(i,j) = a;
        else
            x(i,j) = -a;
        end
    end
end

for i = (m/2+1):m
    for j = 1:(n/2)
        q = max_capacity(x(i,j));
        a = 1
        for l = 1:q
            a = a*2 + b(k);
            k = k + 1;
        end
        if (sign(x(i,j)) >= 0)
            x(i,j) = a;
        else
            x(i,j) = -a;
        end
    end
end
```

APPENDIX A

```
y = ihaar(x);
```

APPENDIX A

```
function y = haar(x);
% y = haar(x)
%

%File Name: haar.m
%Last Modification Date: Wed Nov 1 2000
%File Creation Date: Wed Nov 1 2000
%Author: Jun Tian <jtian@digimarc.com>
%
%Copyright: All software, documentation, and related files in this dis
tribution
%            are Copyright (c) 2000 Digimarc Corporation
%
%Change History:
%
%Bug Report: mail to jtian@digimarc.com
%

[m,n] = size(x);

z(1:(m/2),:) = ceil((x(1:2:m,:) + x(2:2:m,:))/2);
z((m/2+1):m,:) = x(1:2:m,:) - x(2:2:m,:);

y(:,1:(n/2)) = ceil((z(:,1:2:n) + z(:,2:2:n))/2);
y(:,(n/2+1):n) = z(:,1:2:n) - z(:,2:2:n);
```

APPENDIX A

```
function y = ihaar(x);
% y = ihaar(x)
%

%File Name: ihaar.m
%Last Modification Date: Wed Nov 1 2000
%File Creation Date: Wed Nov 1 2000
%Author: Jun Tian <jtian@digimarc.com>
%
%Copyright: All software, documentation, and related files in this dis
tribution
%             are Copyright (c) 2000 Digimarc Corporation
%
%Change History:
%
%Bug Report: mail to jtian@digimarc.com
%

[m,n] = size(x);

z(:,1:2:n) = floor((2*x(:,1:(n/2)) + x(:,(n/2+1):n))/2);
z(:,2:2:n) = floor((2*x(:,1:(n/2)) - x(:,(n/2+1):n))/2);

y(1:2:m,:) = floor((2*z(1:(m/2),:) + z((m/2+1):m,:))/2);
y(2:2:m,:) = floor((z*x(1:(m/2),:) - z((m/2+1):m,:))/2);
```

APPENDIX A